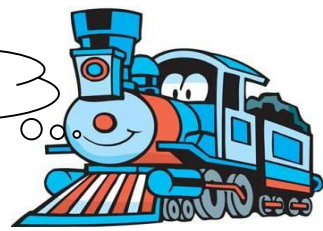


Exam II is coming! I'll be ready!...



BI 121 Exam II!



BI 121 Lecture 14

I. Announcements Last Lab 6, Pulmonary Function Testing + Optional notebook ✓ this Thurs. **Exam II Fri Dec 7, 8am Q?**

II. Nervous System Connections LS ch 3, 4 & 7; DC Module 9

A. Why nerve & muscle unique? How do they signal?

LS pp 62-67, 74-83

B. How does the signal cross the nerve-muscle gap?

LS p 185-92 fig 7-5 p 190; DC pp 69-71 fig 9-4

1. Ca^{2+} bones!...but what else? LS p 190

2. What do black widow spider venom, botulism, curare & nerve gas have in common? Botox LS pp 189-92

III. Muscle Structure & Function LS ch 8 + DC Mod 12

A. Muscle types: cardiac, smooth, skeletal LS fig 8-1

B. How is skeletal muscle organized? LS fig 8-2, DC fig 12-2

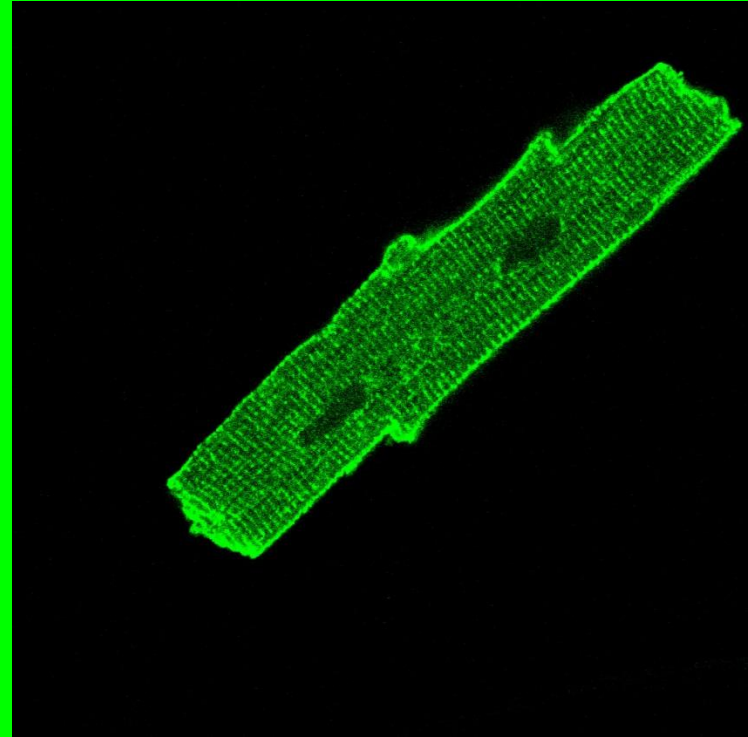
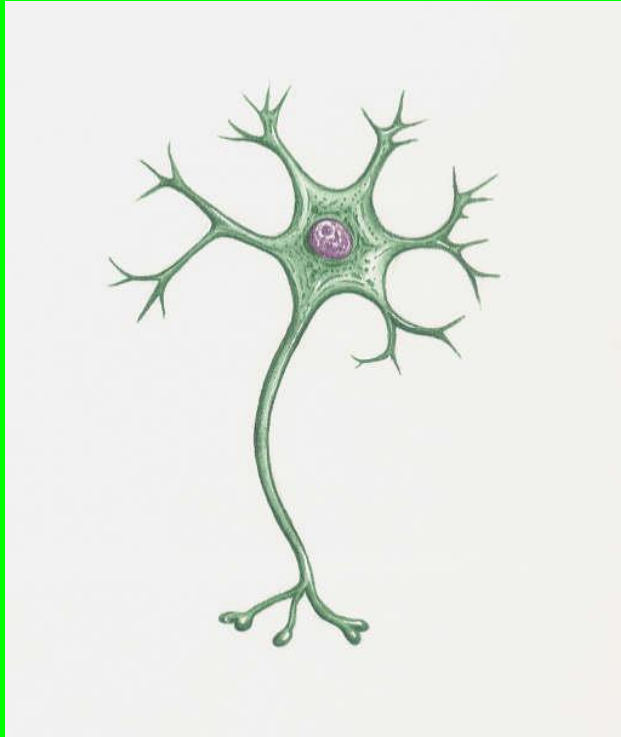
C. What do thick filaments look like? LS fig 8-4, DC fig 12-4

D. Thin filaments? Banding pattern LS fig 8-5, 8-3, 8-7

E. How do muscles contract? LS fig 8-6, 8-10

F. What's a cross-bridge cycle? LS fig 8-11 +...

Why are nerve & muscle unique?



They are excitable!!

Action Potentials \equiv Spikes \equiv Impulses

Ultra-short reversal of membrane potential

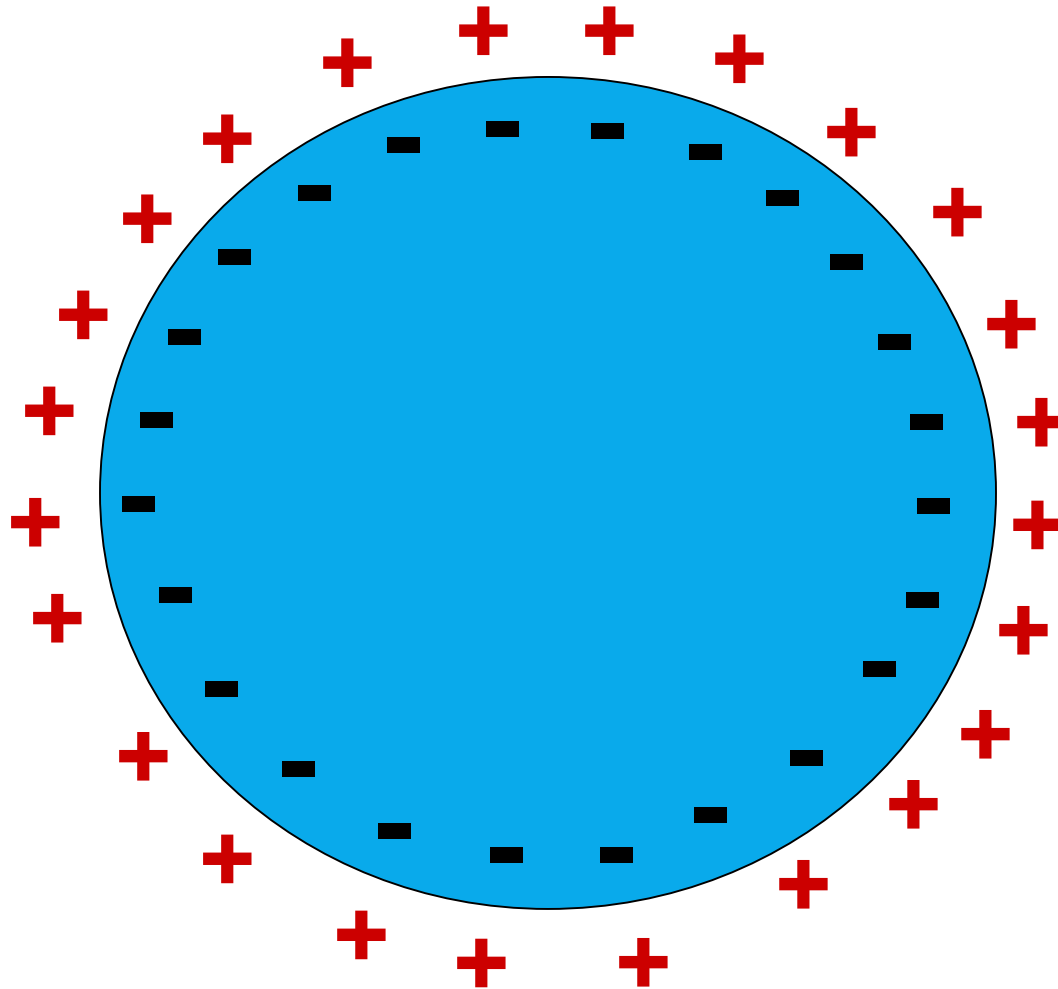
Only in nerve and muscle cells

Maintains strength over distance

Primary way nerves & muscles communicate!



"Resting"/Membrane Potential?



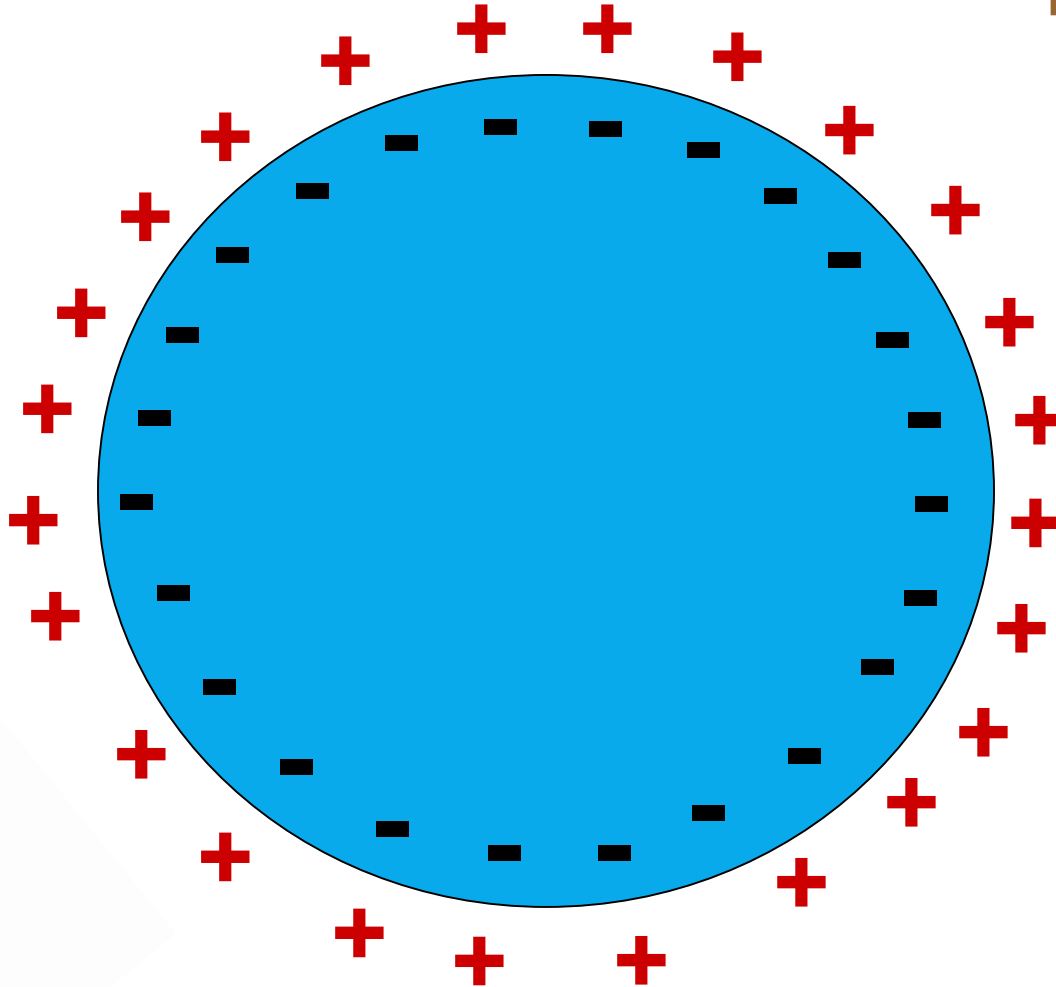
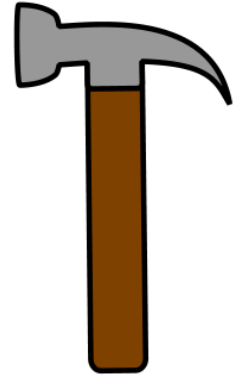
Cells are slightly negative inside!

Stimulate Cell @ Rest

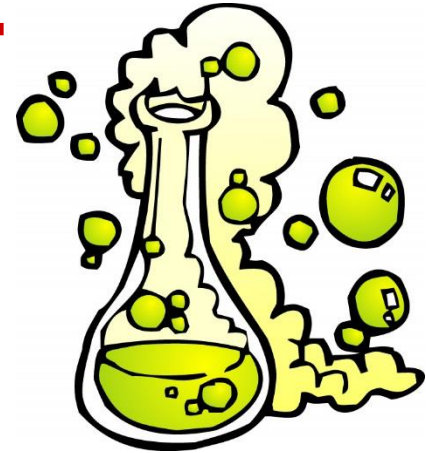
Thermal



Mechanical



1

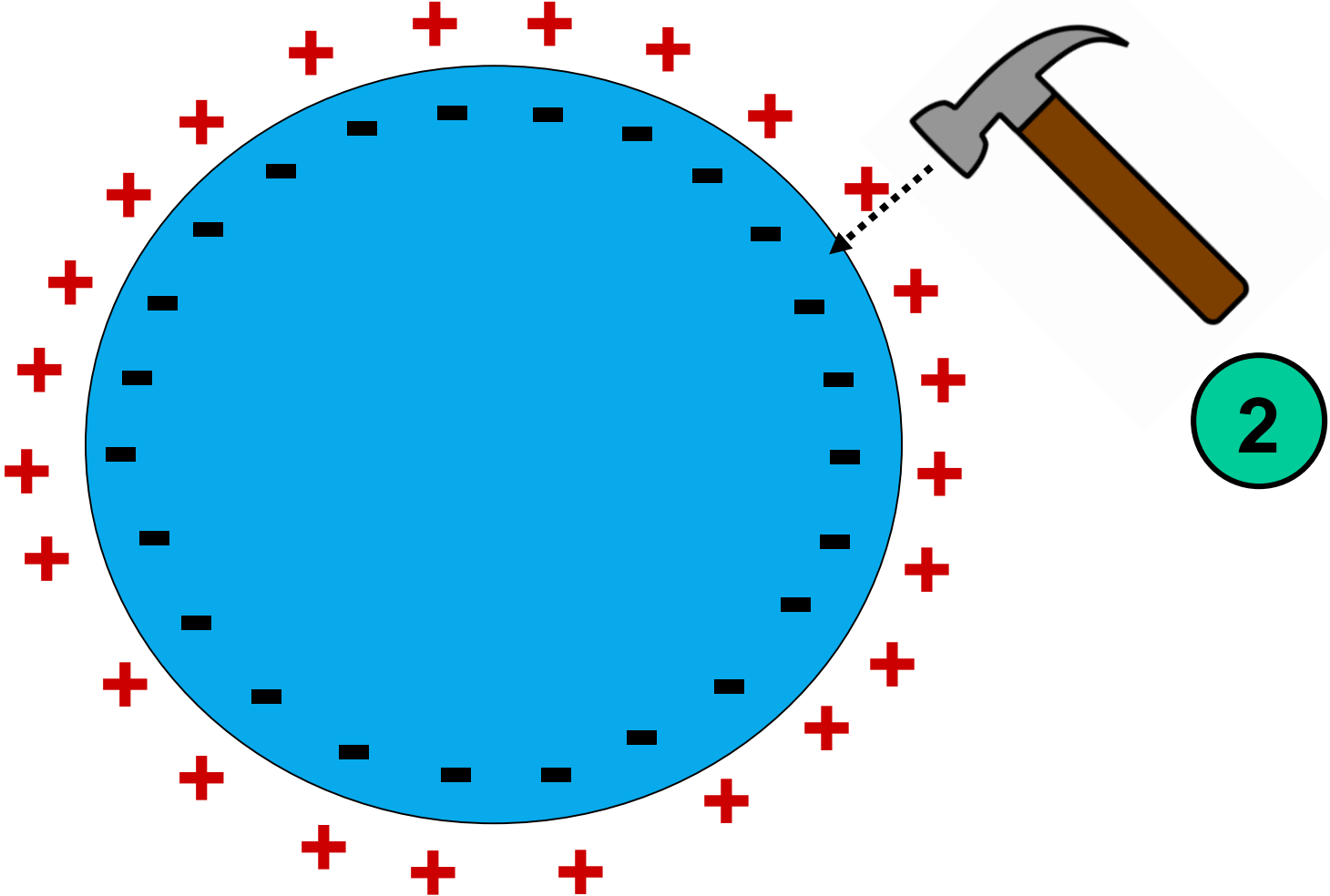


Electrical

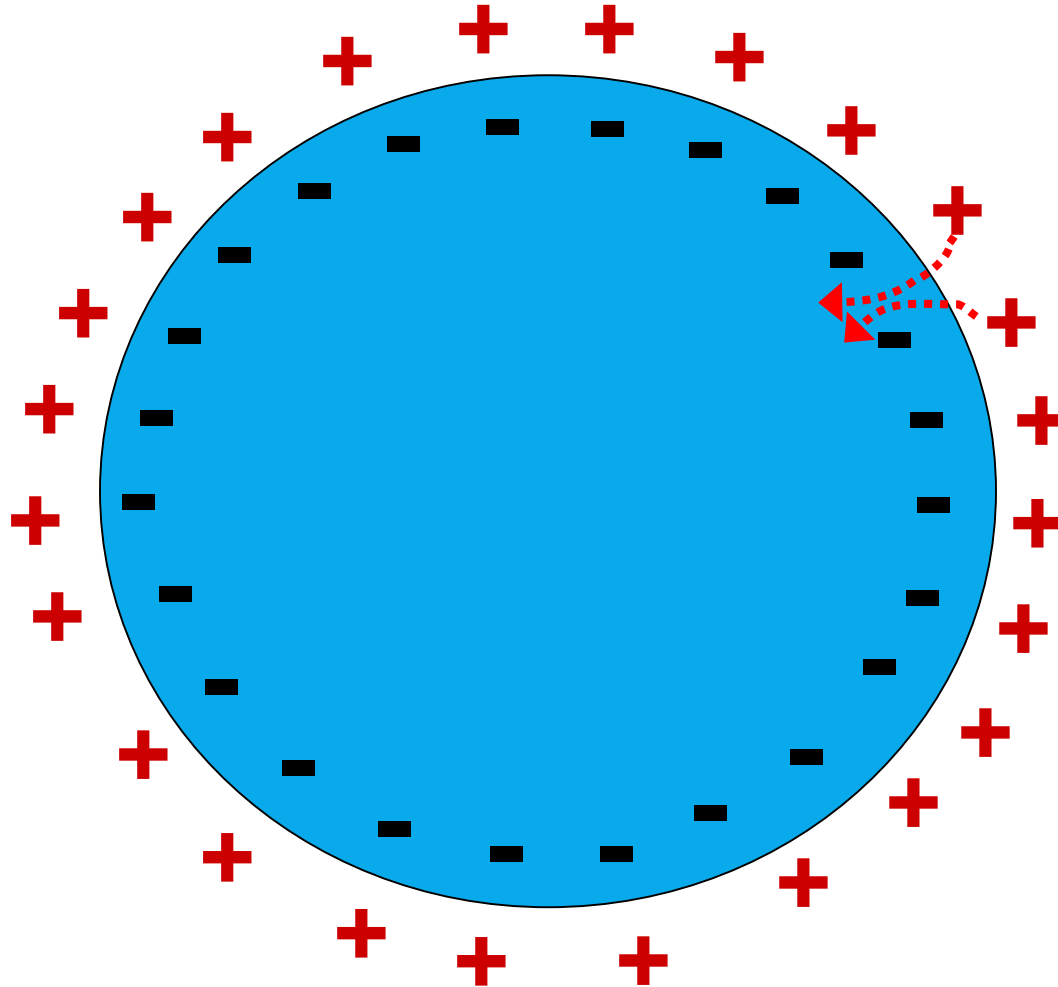


Chemical

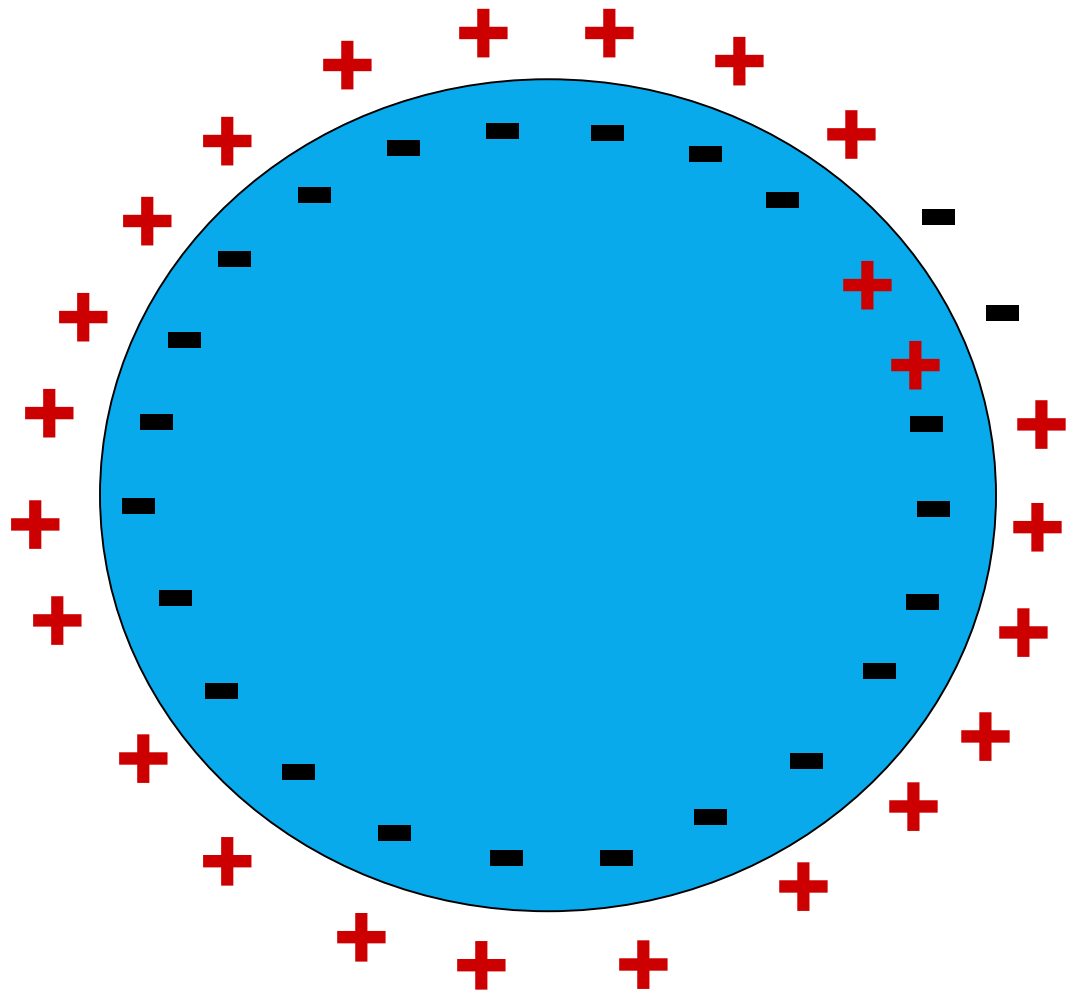
Tap! Tap!..



Changes Cell Membrane Permeability to Sodium/Na+!

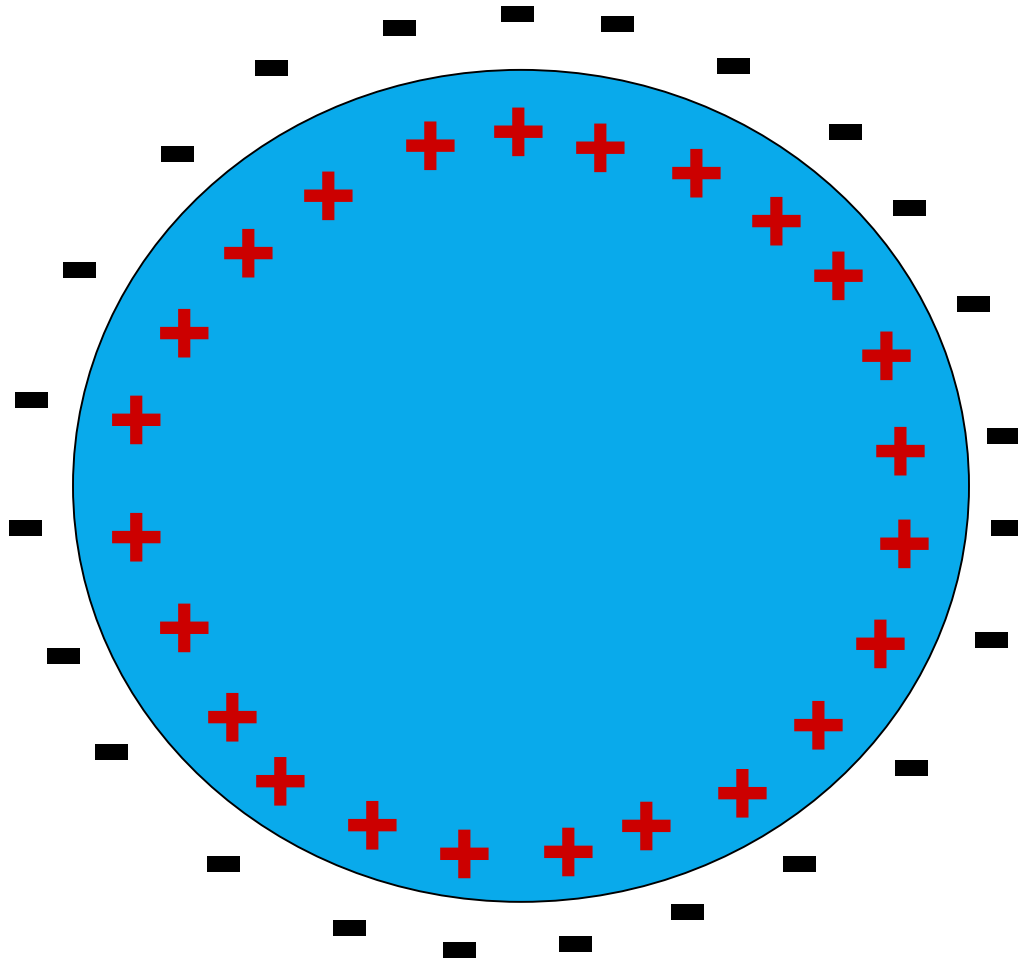


+ Charges/Na+ Rushes In!



4

Action Potential has occurred!



5

Brief (1-2 ms) reversal to + inside cell!

Mechanical
Chemical
Electrical
Thermal

Triggering event



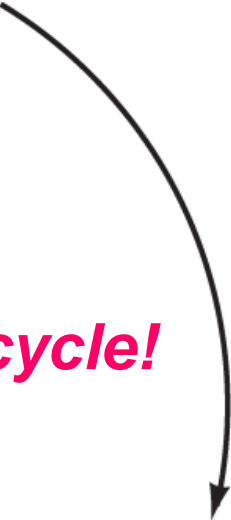
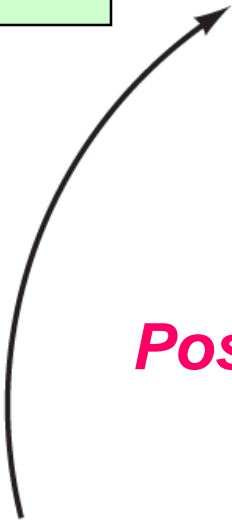
Depolarization
(decreased membrane potential)

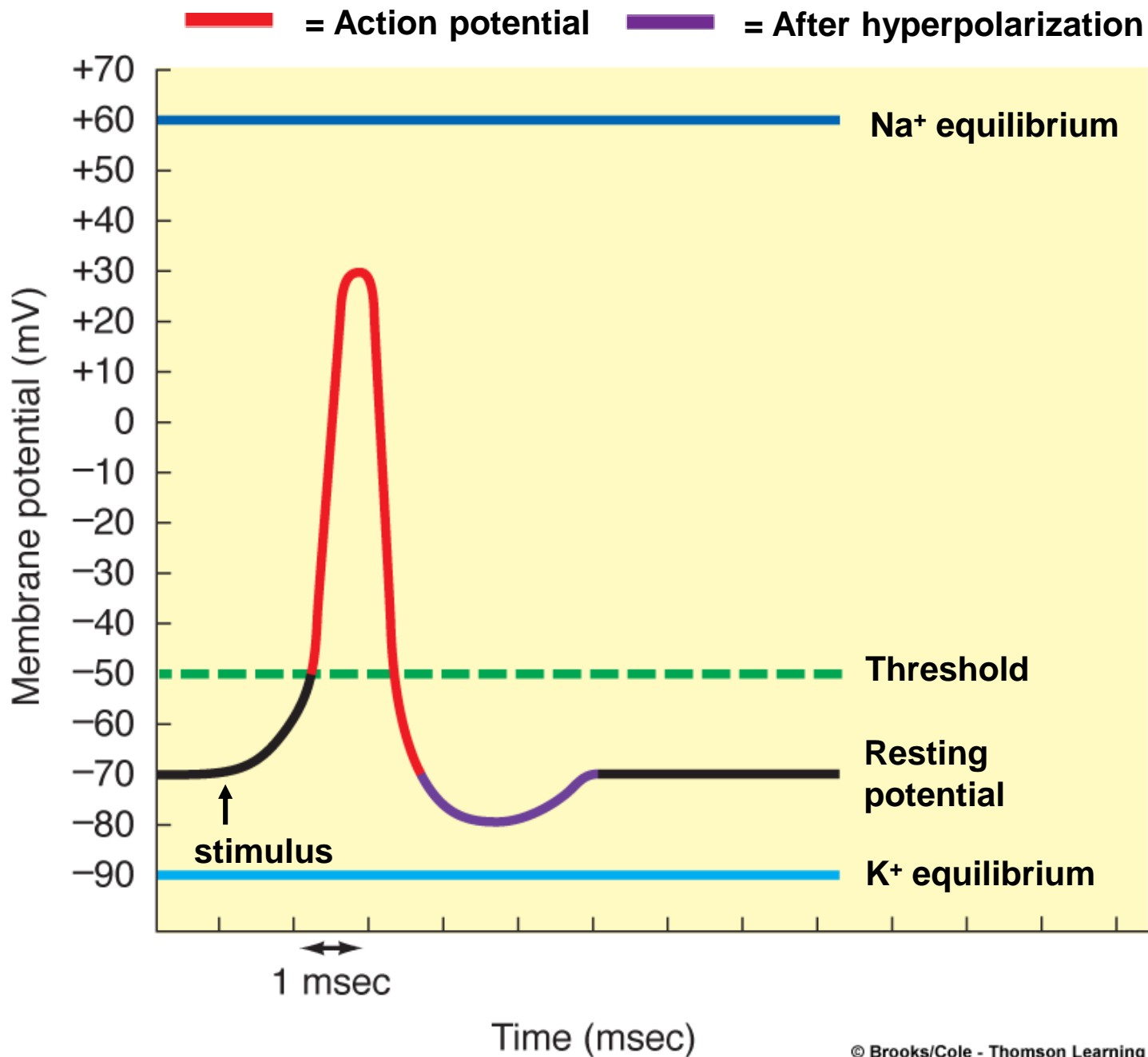
Positive-feedback cycle!

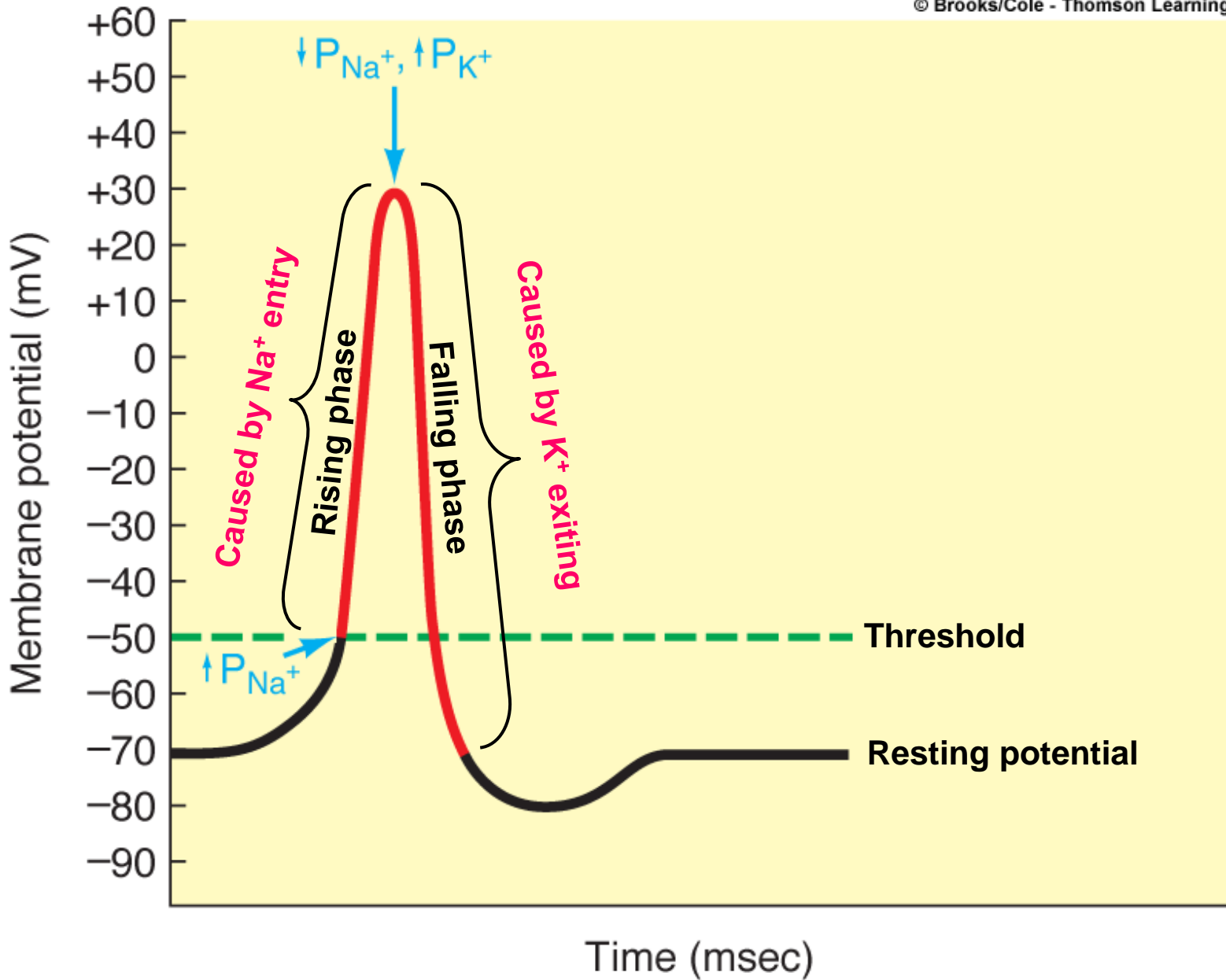
+

Influx of Na⁺
(which further
decreases
membrane potential)

Opening of some
voltage-gated
Na⁺ channels

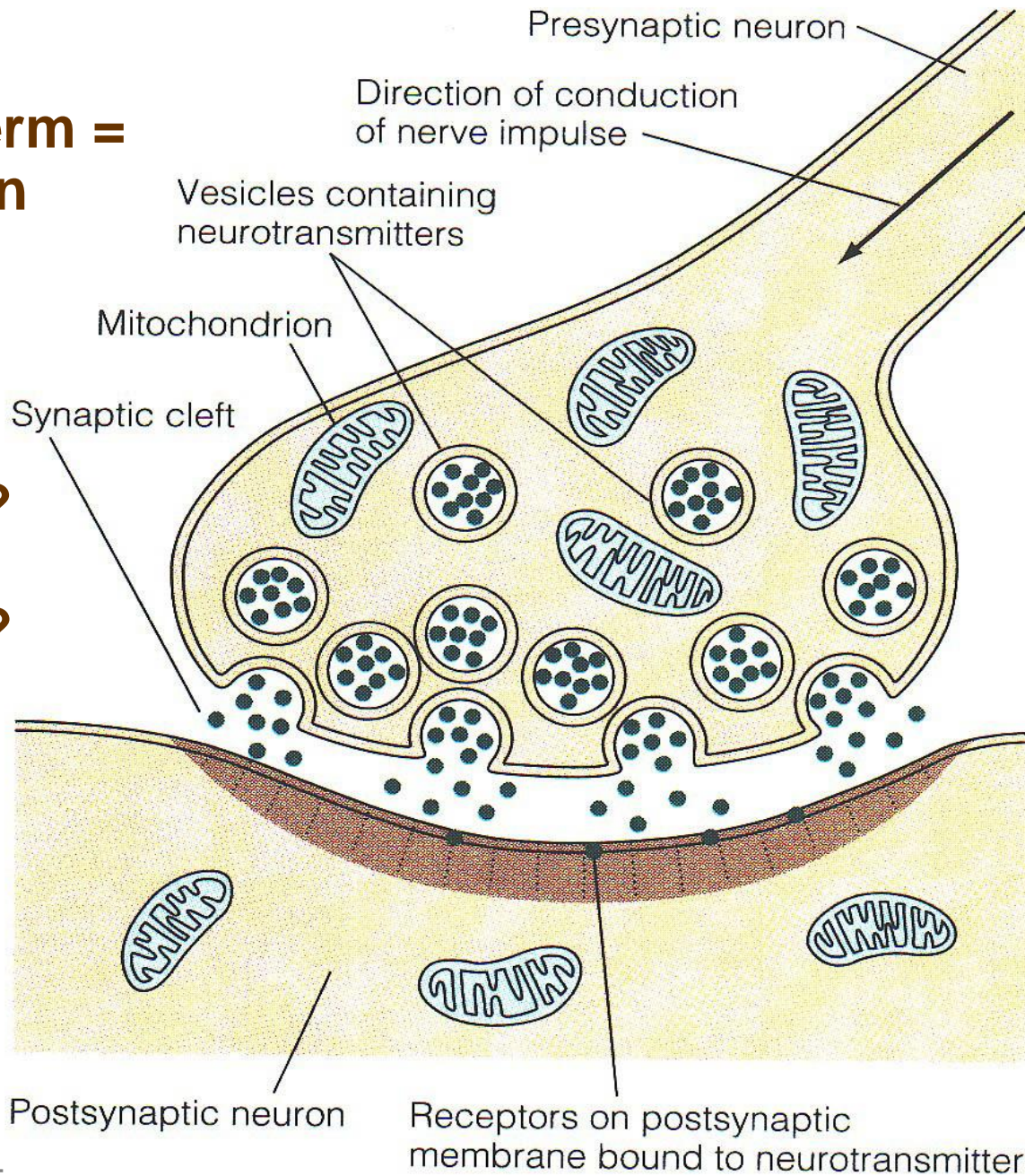






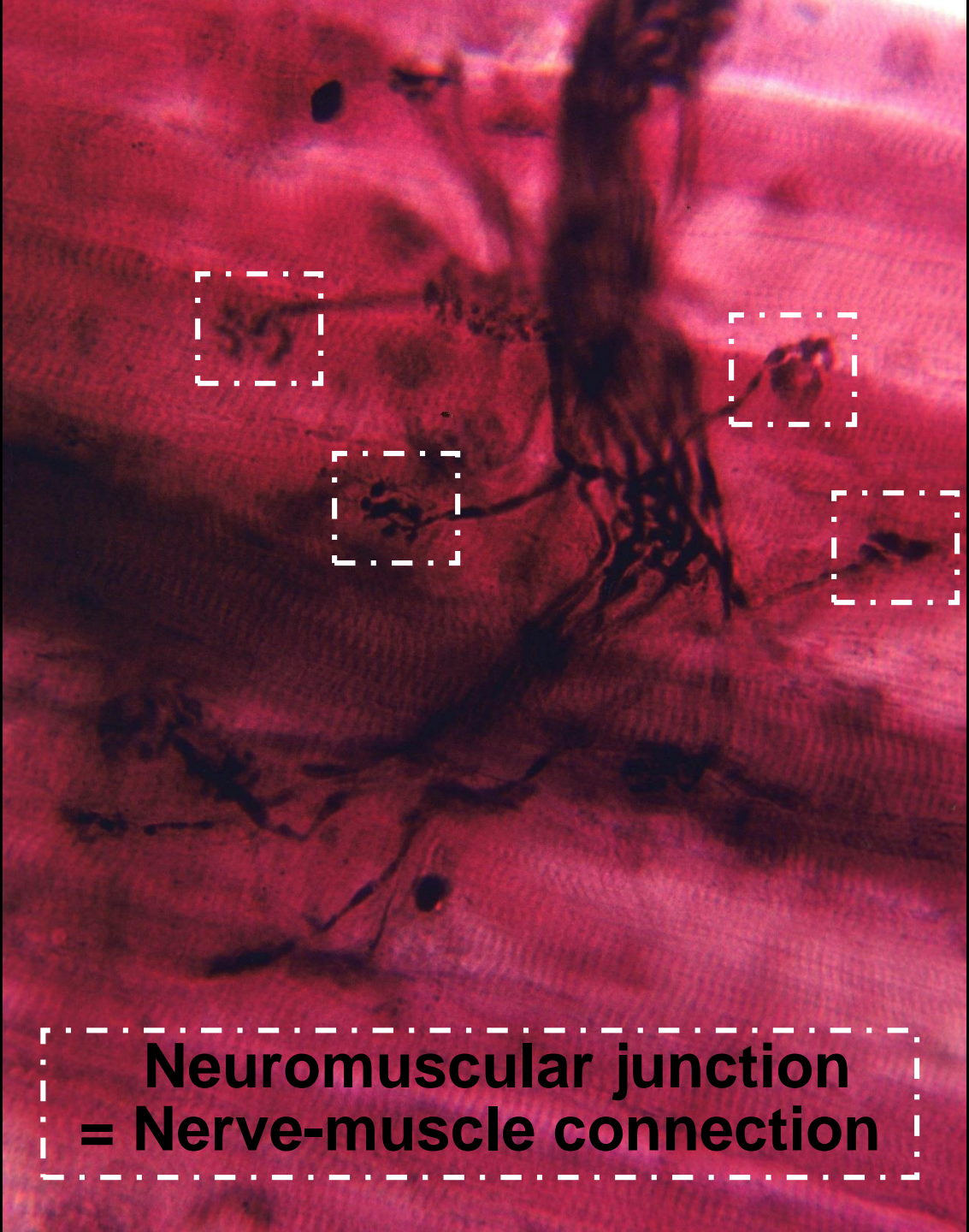
Synapse
Generic term =
connection
between
excitable
cells!

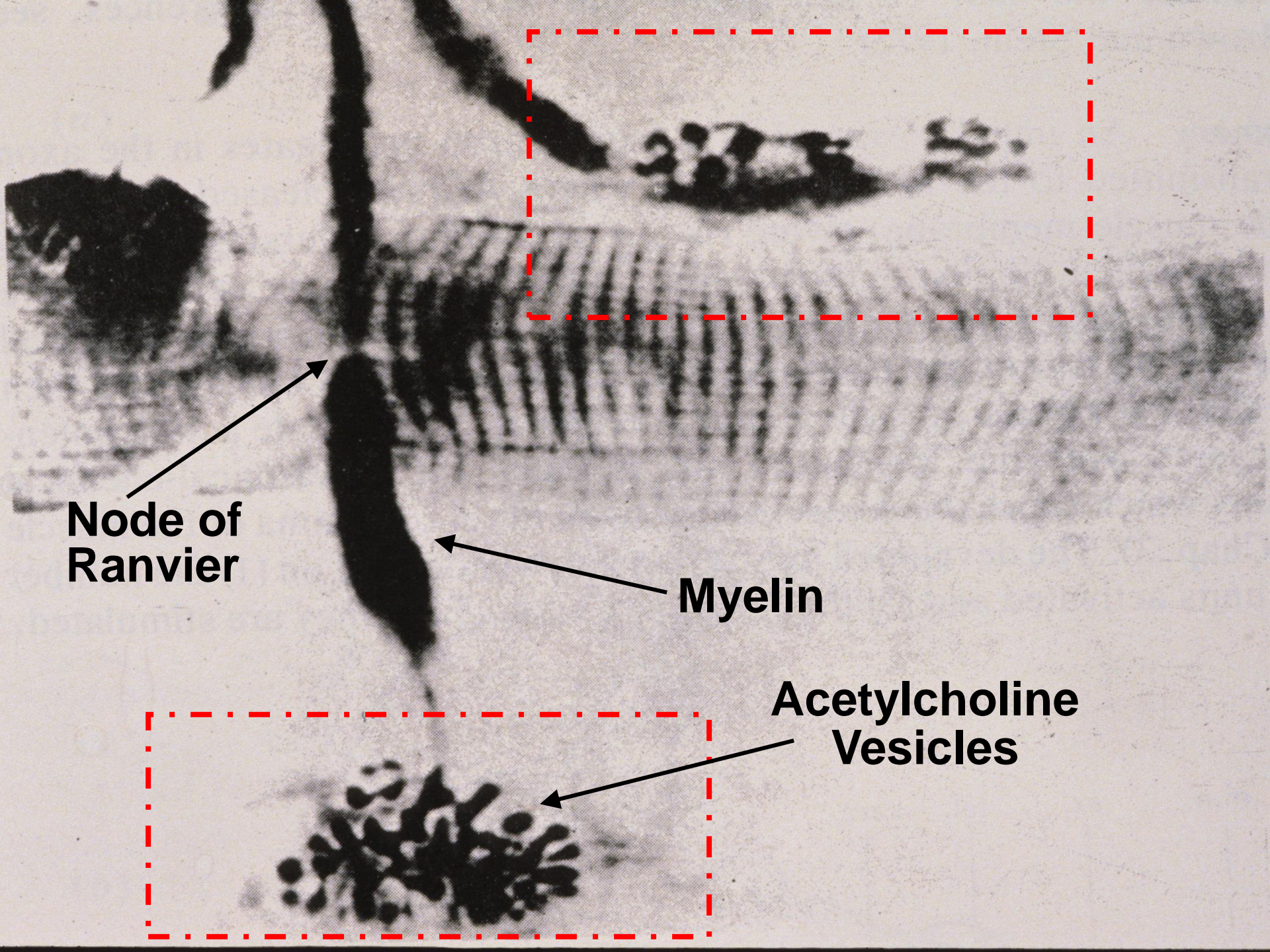
Chemical?
or
Electrical?



H Howard 1980

**Neuromuscular junction
= Nerve-muscle connection**



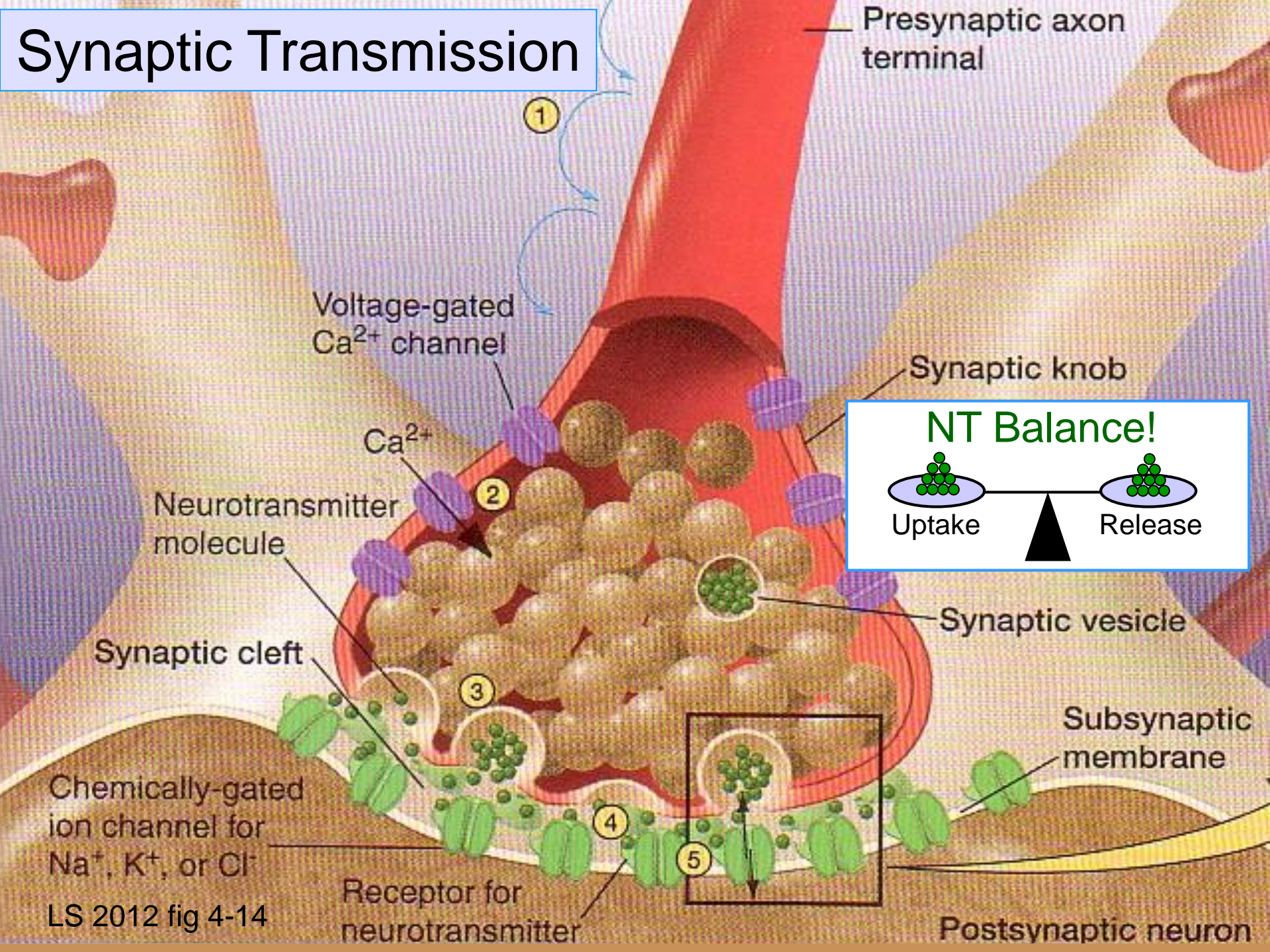


**Node of
Ranvier**

Myelin

**Acetylcholine
Vesicles**

Synaptic Transmission



Presynaptic axon terminal

1

Voltage-gated Ca^{2+} channel

Synaptic knob

NT Balance!

Uptake Release

Ca^{2+}

Neurotransmitter molecule

2

Synaptic vesicle

Synaptic cleft

3

Subsynaptic membrane

Chemically-gated ion channel for Na^+ , K^+ , or Cl^-

4

5

Receptor for neurotransmitter

Postsynaptic neuron

Other Links That May Be Helpful!

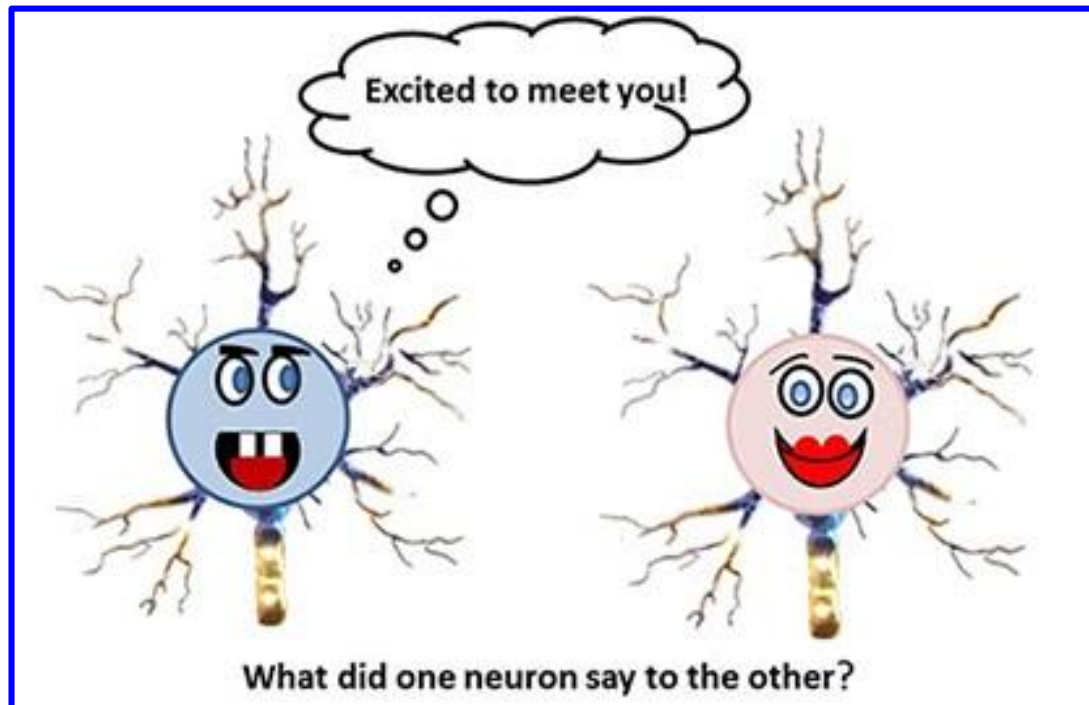
<https://www.youtube.com/watch?v=6RbPIOq0O3w>

<https://www.youtube.com/watch?v=mltV4rC57kM>

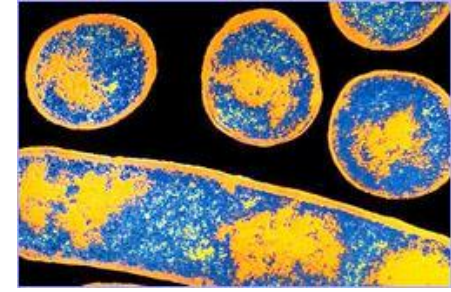
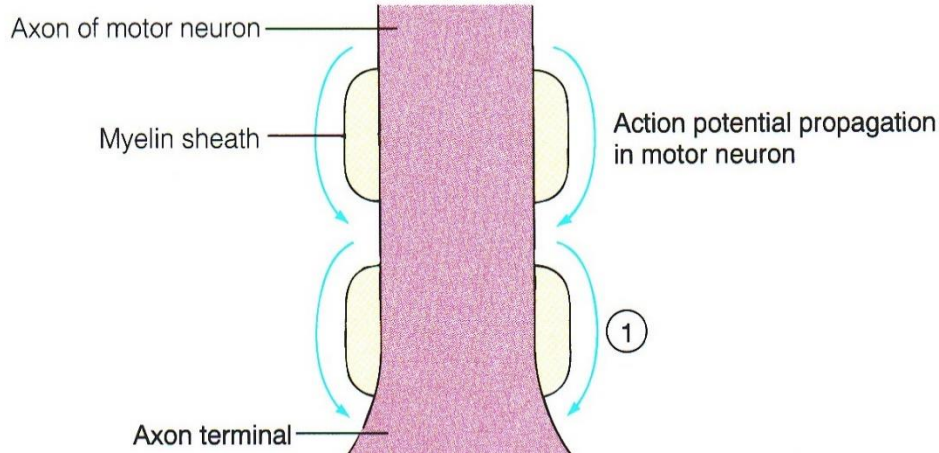
<https://www.youtube.com/watch?v=WhowH0kb7n0>

<http://sites.sinauer.com/psychopharm2e/animation03.01.html>

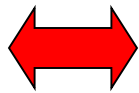
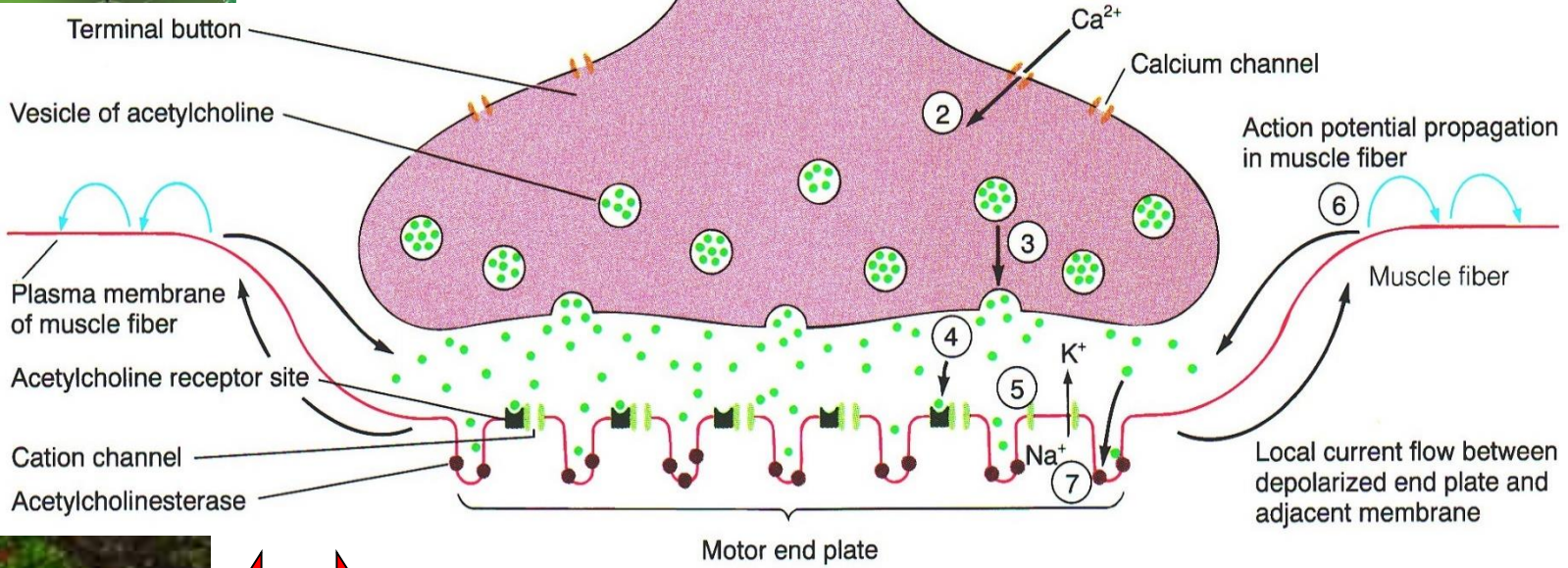
<https://www.youtube.com/watch?v=VitFvNvRIIY>



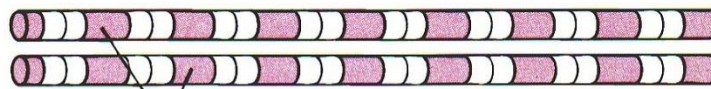
↑ 3



~~3~~



4



Contractile elements within muscle fiber

~~7~~



Break for discussion/questions!



Striated muscle

Unstriated muscle

Skeletal muscle

Cardiac muscle

Smooth muscle

Ed Reschke

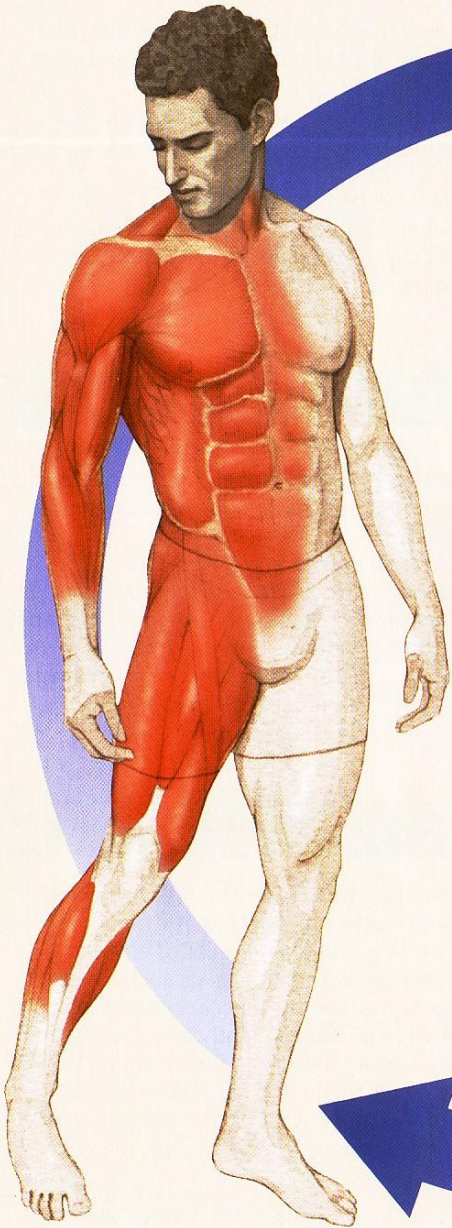
Ed Reschke

Biophoto/Photo Researchers, Inc.

Voluntary muscle

Involuntary muscle

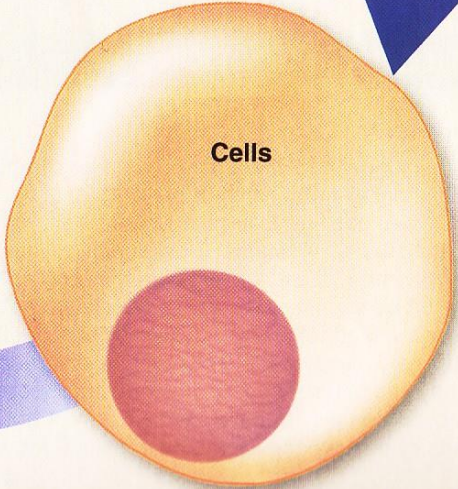
Skeletal Muscles



Body systems
maintain homeostasis

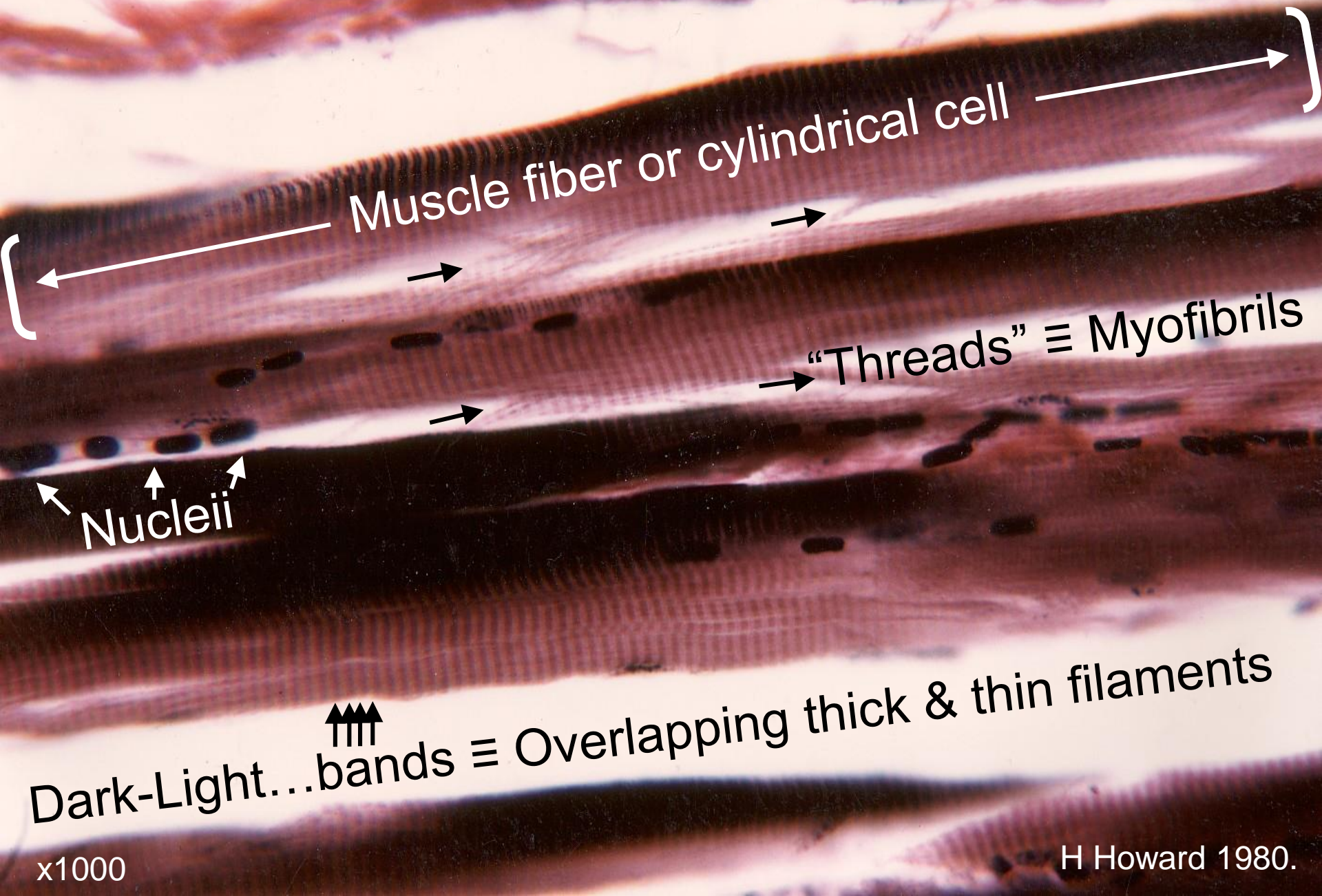
Homeostasis
Skeletal muscles contribute to homeostasis by playing a major role in the procurement of food, breathing, heat generation for maintenance of body temperature, and movement away from harm.

Homeostasis is
essential for
survival of cells



Cells make up
body systems

Skeletal Muscle Histology: Microscopic Anatomy



Muscle fiber or cylindrical cell

Nucleii

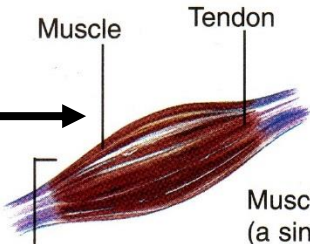
"Threads" ≡ Myofibrils

Dark-Light...bands ≡ Overlapping thick & thin filaments

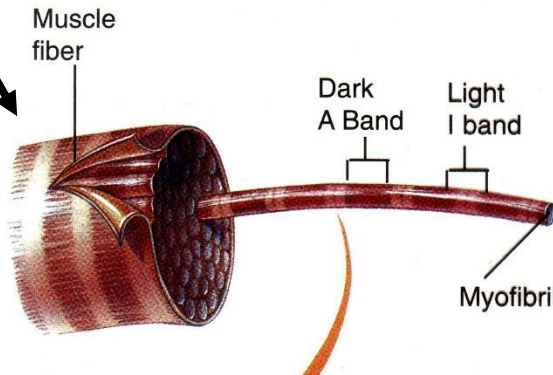
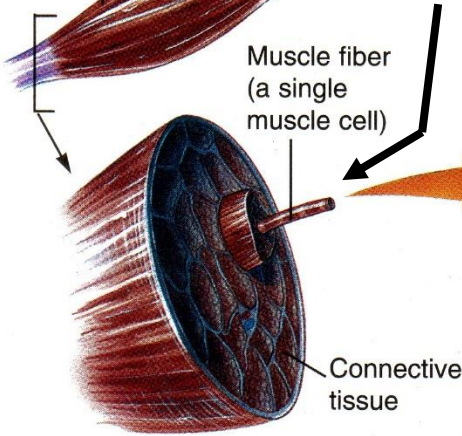
x1000

H Howard 1980.

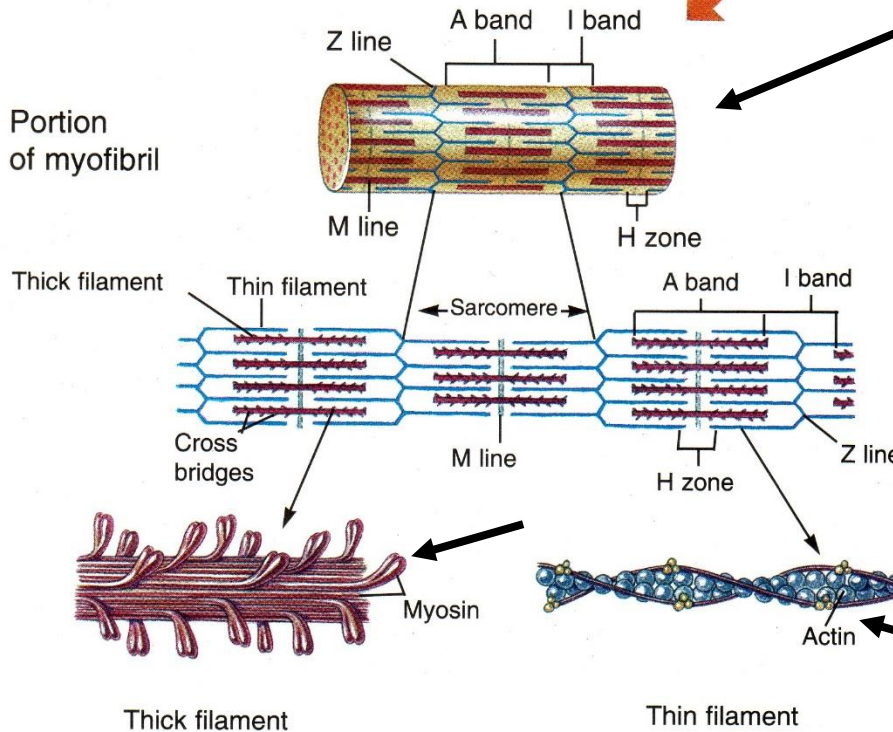
**Organ =
Muscle**



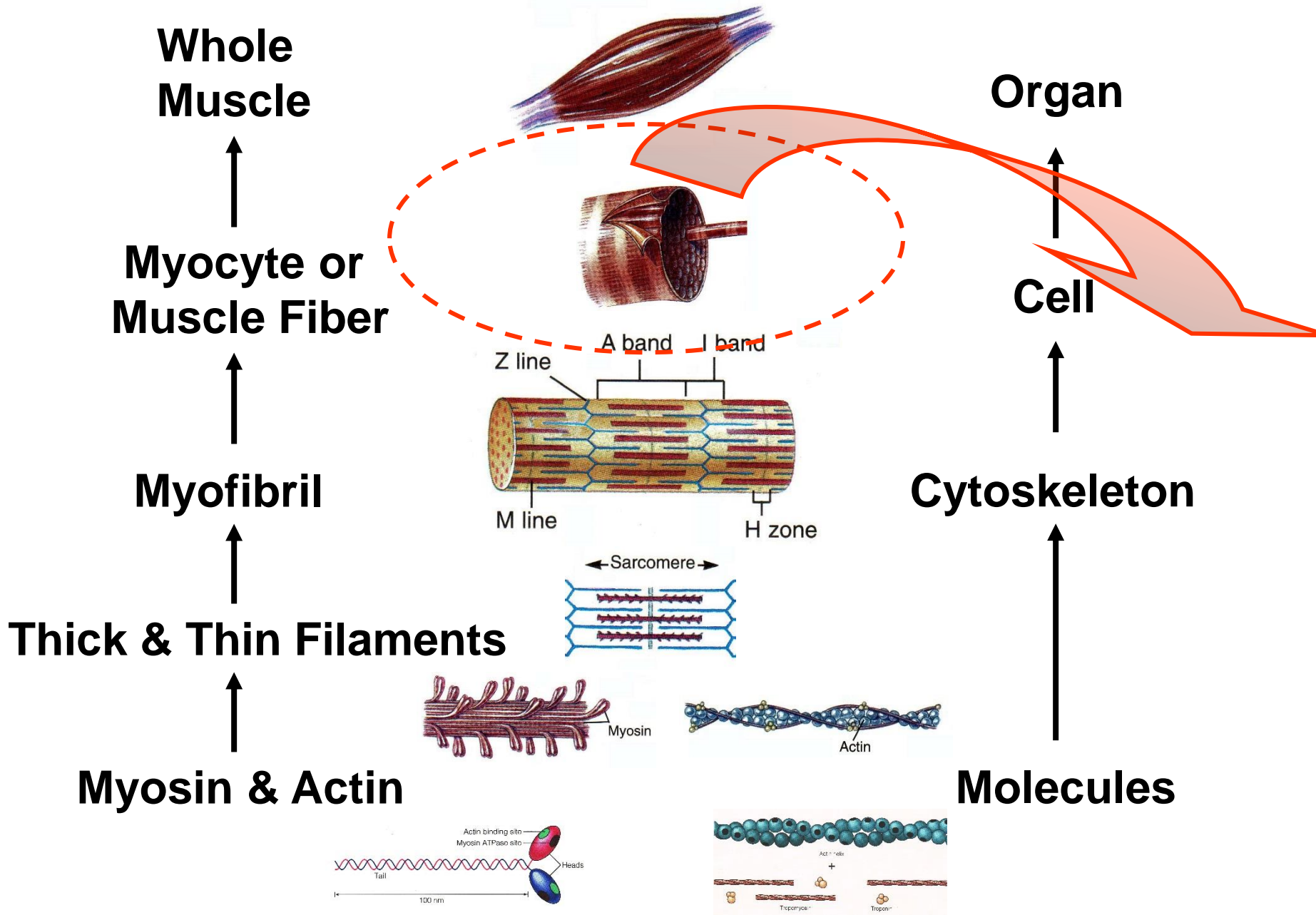
Cell = Myocyte = Fiber

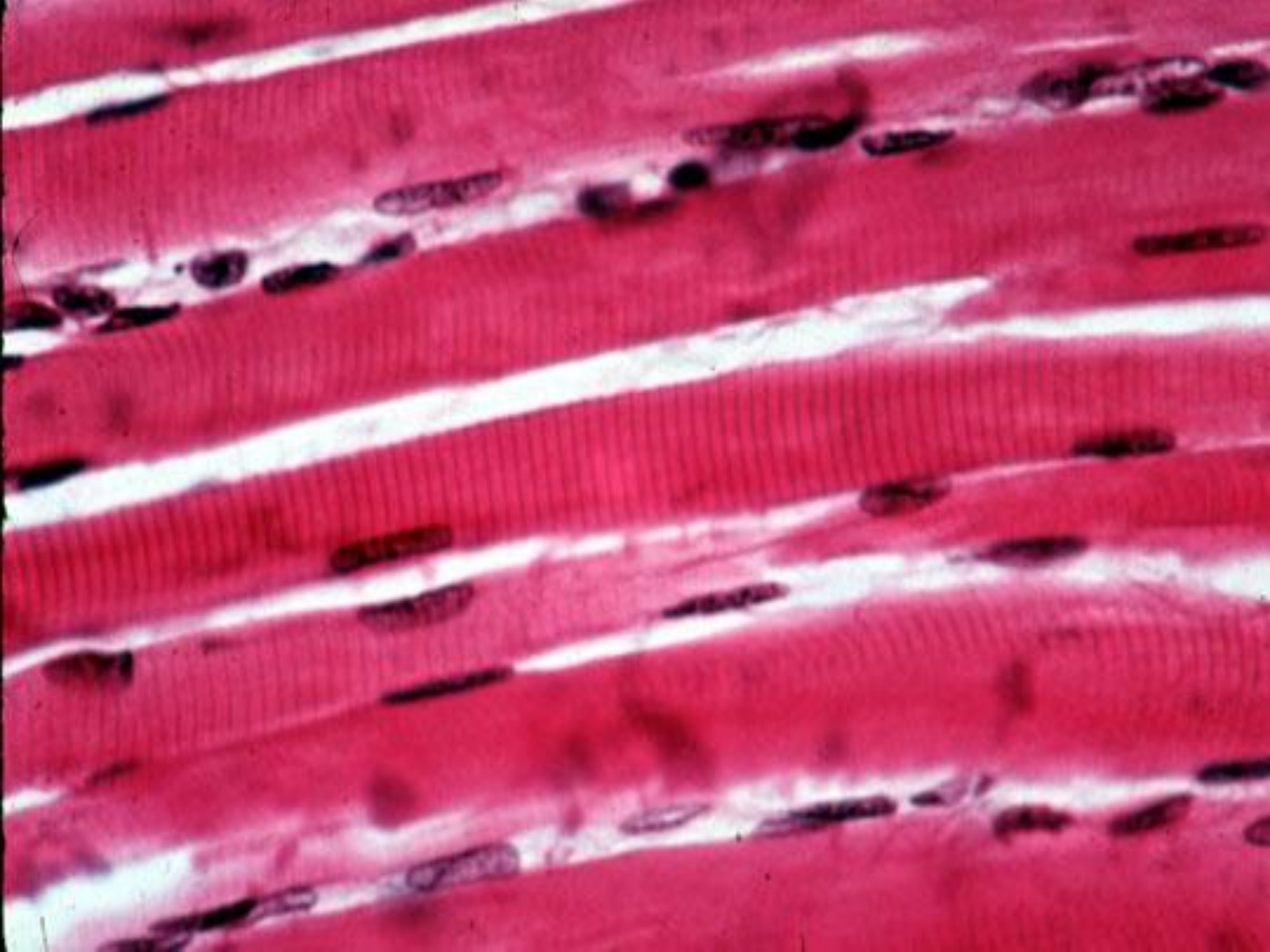


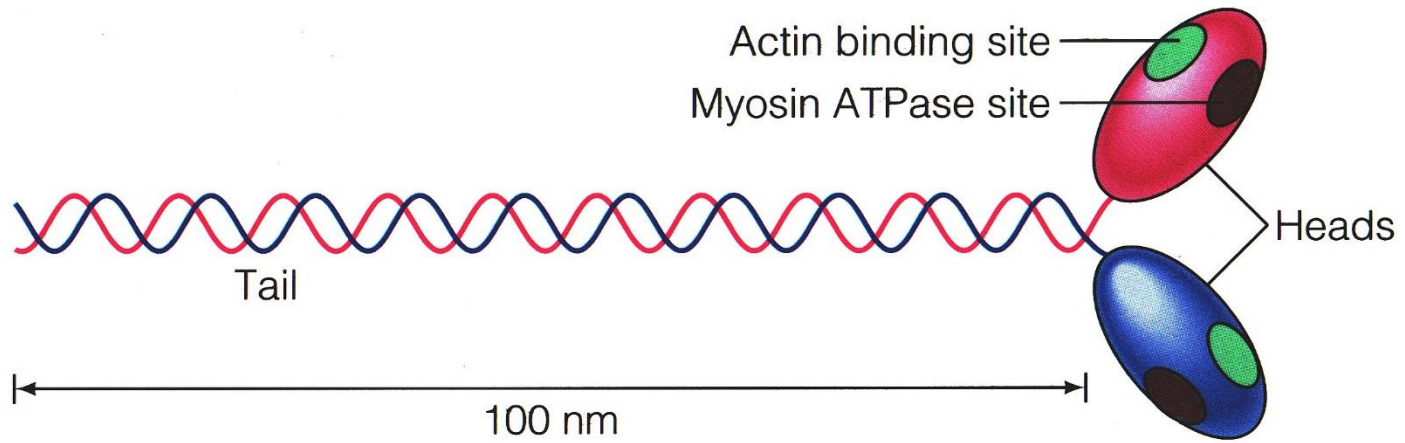
**Subcellular =
Cytoskeleton**



**Molecules =
Actin & Myosin**

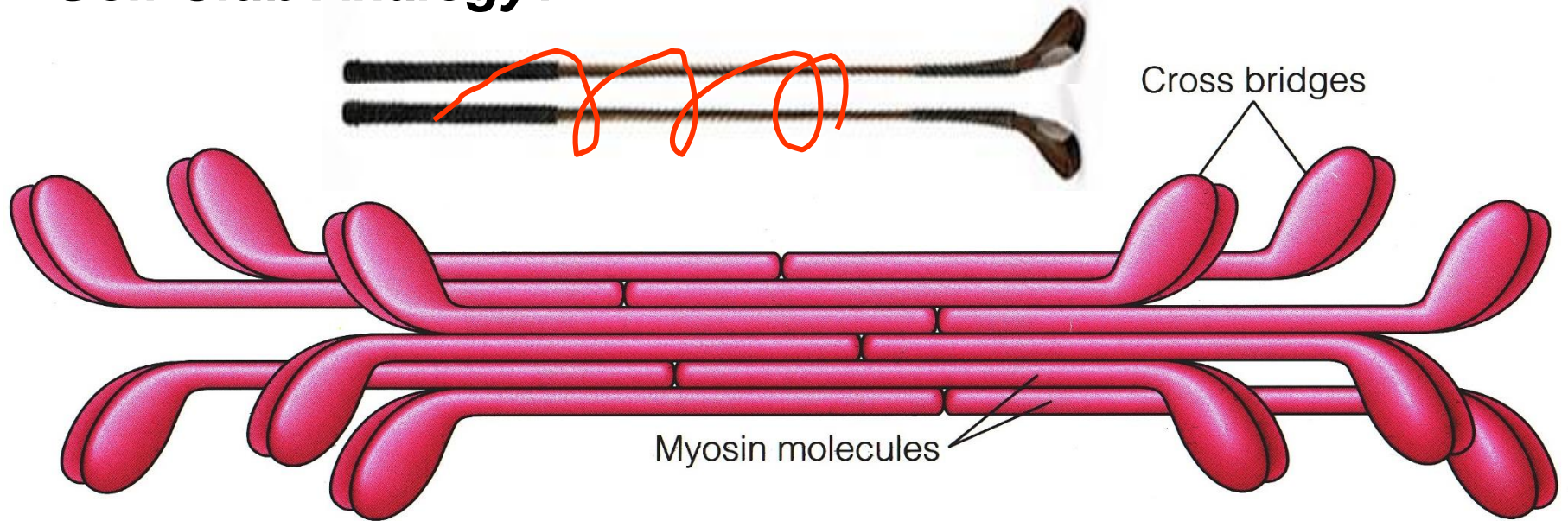






(a)

Golf Club Analogy?



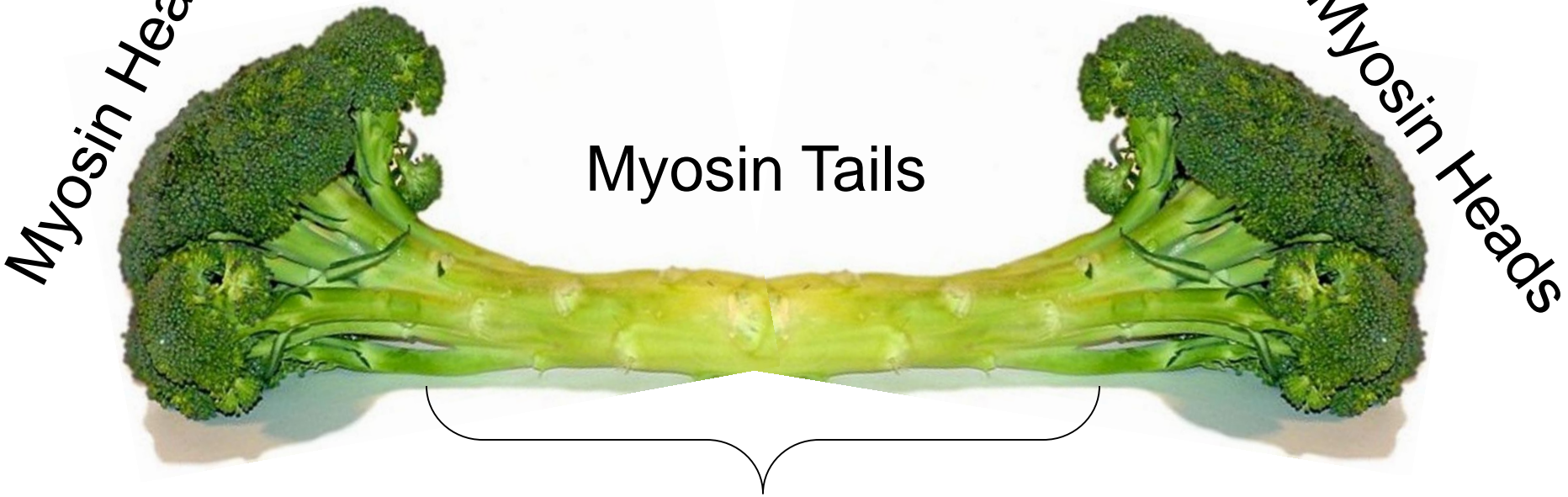
(b)

Broccoli Analogy?

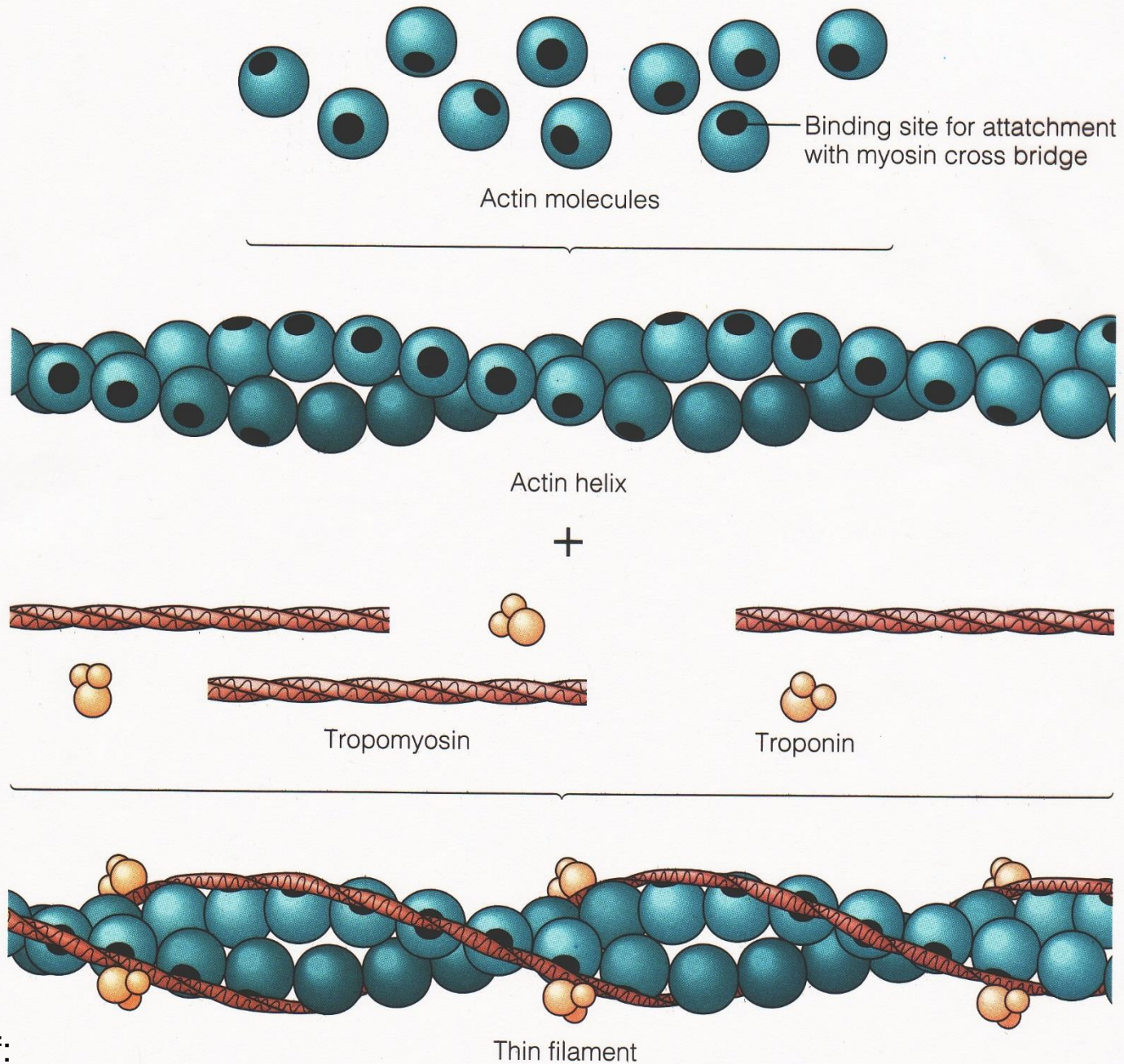
Myosin Heads

Myosin Heads

Myosin Tails

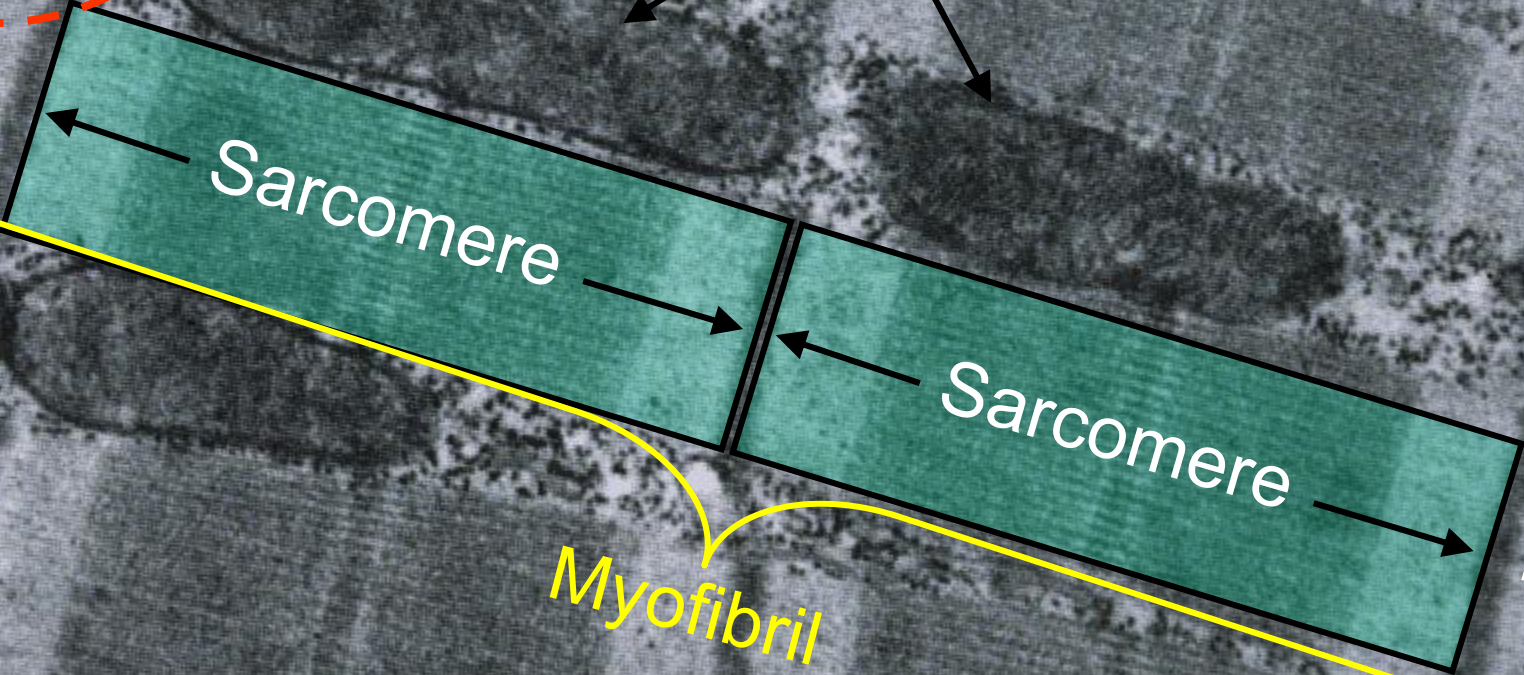


Bare Zone



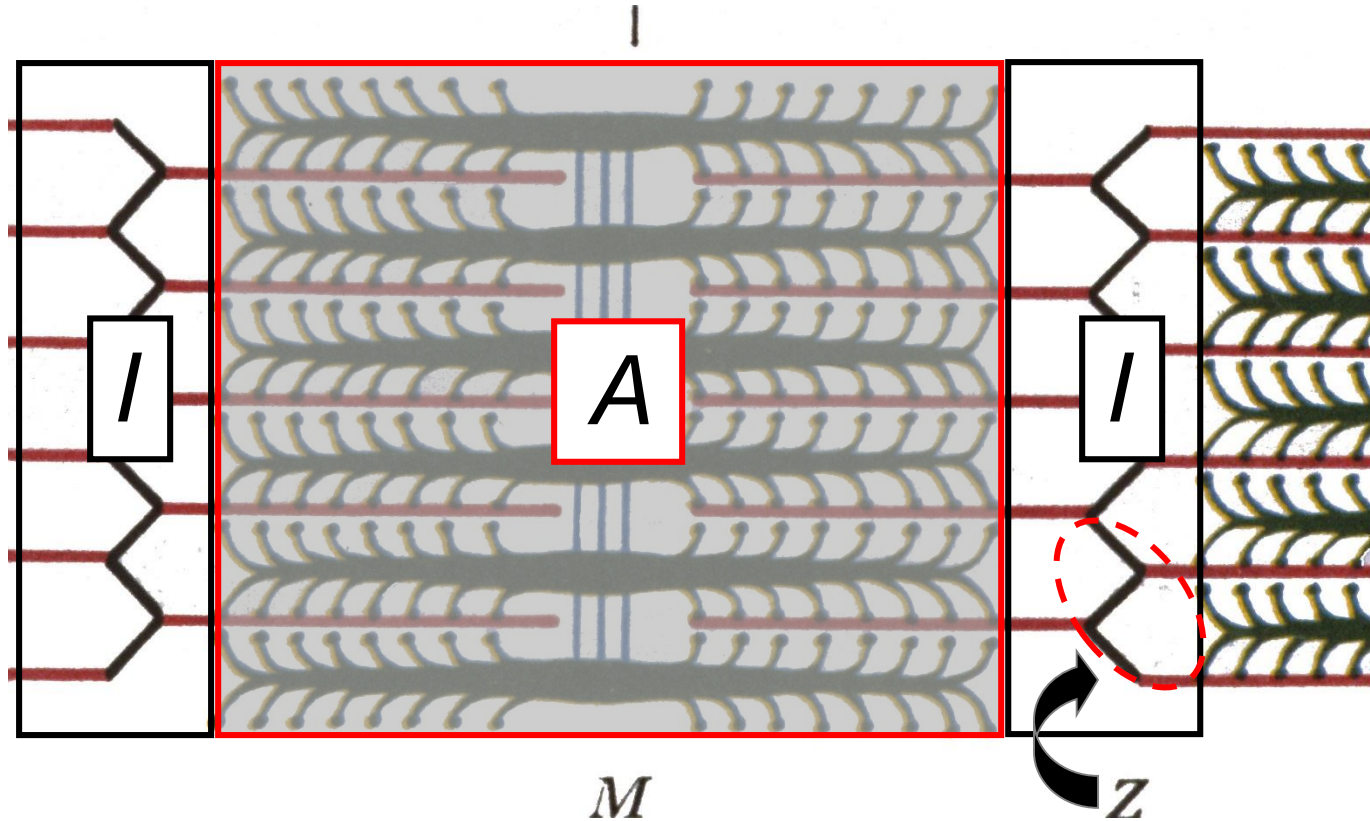
Triad \equiv T tubule abutting cisternae

Mitochondria



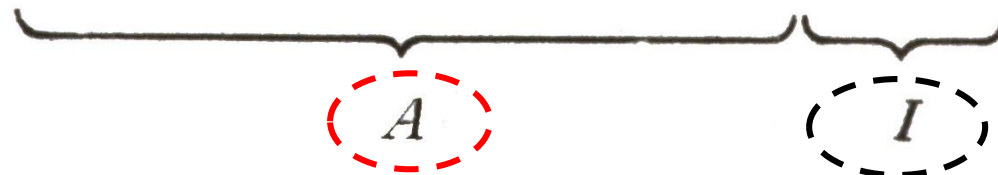
A Band = Dark Band

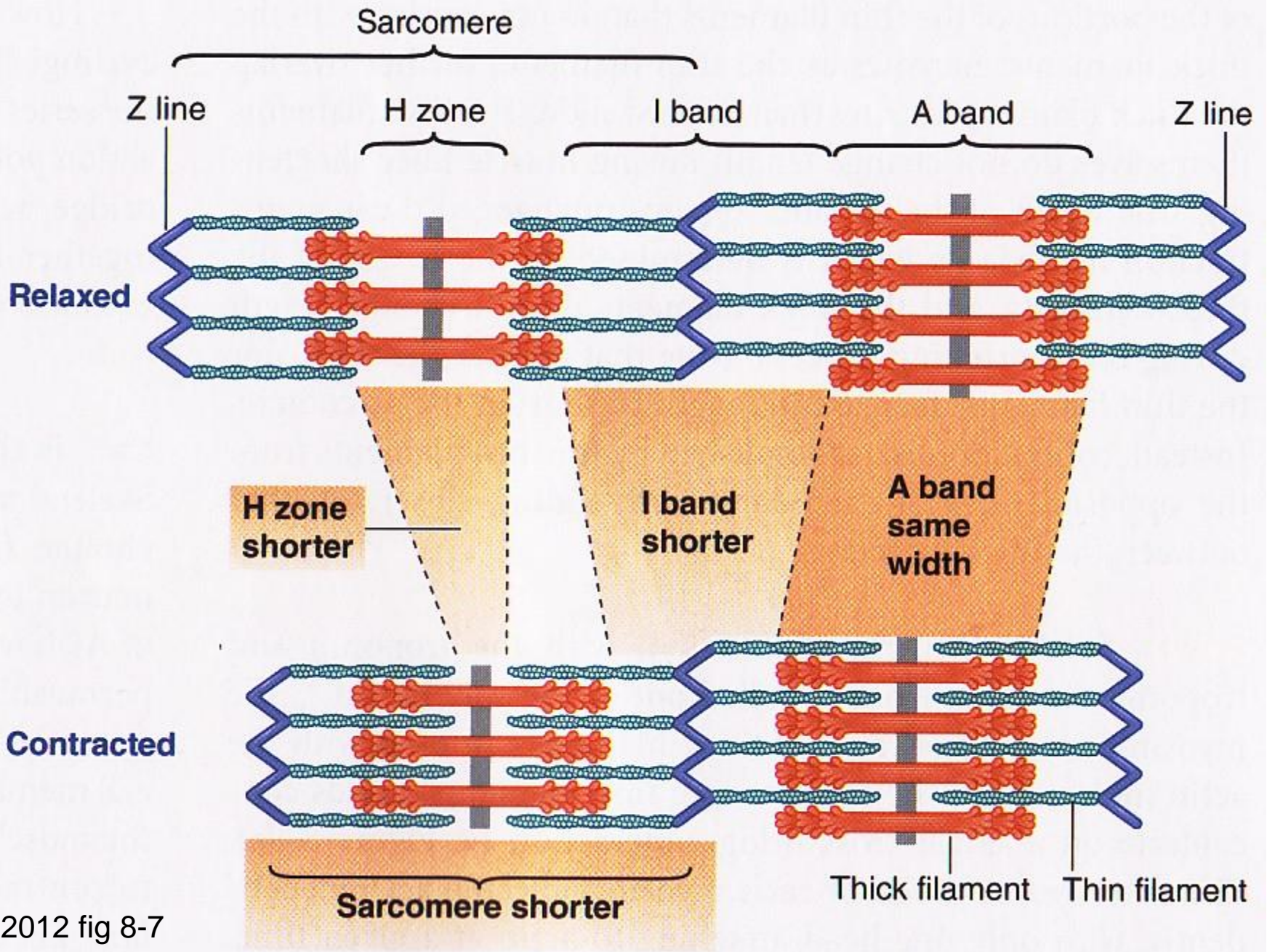
Anisotropic = Light Can't Shine Through



/ Band = Light Band

/sotropic = Light Can Shine Through





LS 2012 fig 8-7

Discussion + Time for Questions!

